Let's Talk Water – Questions and BARCASS

By Dr. Mike Strobel

After a few delays because of other topics in the news that needed to be addressed, we will now begin a discussion of the USGS-DRI Ground Water Study. But first, I would like to answer a question I received.

Let me take off my USGS ball cap and put on my Julia Child chef hat. The question is related to cooking foods, and especially adjusting cooking temperatures at high altitudes. Specifically, when adjusting a cooking thermometer to freezing (32 degrees F sea level) and boiling (212 degrees F at sea level), are there adjustments for high altitudes?

I did some simple calculations for the elevation at Ely (6260 ft) and found that for that altitude, water boils at around 200 degrees F (verses 212 degrees F for sea level). This can be a problem because it often takes longer to cook foods according to the instructions because boiling is reached at lower temperatures.

When I worked in the Andes of Peru back in the 1980s, we had a base camp at 17,000 feet. We used pressure cookers to cook our food because at that high altitude, water boiled at lower temperatures and food didn't cook properly. The pressure cookers increased the pressure in the cooking vessel and therefore allowed higher temperatures to be reached before boiling occurred.

There are stories of Tibetan monks who usually drank their tea when the cup of water was boiling because at their high altitude, this was a lower temperature. When these monks went to visit other places closer to sea level, they would burn their mouths trying to drink the tea at that boiling point, which was much hotter.

The freezing point for water at Ely's altitude is about the same as at sea level. Therefore, one could use a bucket of slushy ice water and be at the normal temperatures for calibrating a cooking thermometer.

Pressure does play a part in changing freezing points, which is often illustrated using the ice skate example. In this example, the pressure at the edge of the skate blade on the ice, along with friction and other factors, actually causes melting to occur at that point and therefore allows glide.

Likewise in temperate climates, many glaciers, which are masses of ice, are actually wet at their bases because of the pressure melting caused by the weight of the overlying ice mass. Water at the base of some of these glaciers has been credited with causing surging or relatively rapid movement of the glacier.

In the two examples I've given, there are other factors that affect the melting, but I kept this simple to illustrate the point. Also, these two conditions described are much more extreme pressure differences than that caused by altitude in Ely.

Now, to put on my USGS ball cap again and begin our discussion of the USGS-DRI ground water study. The name of this study is BARCASS. This is the acronym for the Water Resources of the **B**asin **a**nd **R**ange **C**arbonate **A**quifer **S**ystem **S**tudy (BARCASS) in White Pine County Nevada, and adjacent areas in Nevada and Utah.

The study was mandated by Lincoln County Conservation, Recreation, and Development Act of 2004 (short title) and funded at $6 million provided by amendments to the Southern Nevada Public Lands Management Act (SNPLMA).

According to the Act, a draft report to the Secretary of the Interior is due by June 1, 2007 and a final report to Congress is due by December 1, 2007.

The study is to be carried out by representatives from the USGS, DRI, and a representative from the State of Utah. The present participants in the study are the USGS – Water Resources Nevada and Utah Districts, USGS – Geology Denver and Menlo Park offices, the Desert Research Institute (DRI), and the Utah State Engineers Office.

In order to discuss what the study will plan to accomplish, we will first look at the specific wording of the Act. It states that "The Secretary, acting through the United States Geological Survey, the Desert Research Institute, and a designee from the State of Utah shall conduct a study to investigate ground water quantity, quality, and flow characteristics in the deep carbonate and alluvial aquifers of White Pine County, Nevada, and any groundwater basins that are located in White Pine County, Nevada, or Lincoln County, Nevada, and adjacent areas in Utah".

In addition, it states that "The study shall (a) focus on a review of existing data and may include new data, (b) determine the approximate volume of water stored in aquifers in those areas, (c) determine the discharge and recharge characteristics of each aquifer system, (d) determine the hydrogeologic and other controls that govern the discharge and recharge of each aquifer system, and (e) develop maps at a consistent scale depicting aquifer systems and the recharge and discharge areas of such systems."

In order to accomplish these elements, the study has outlined 6 tasks to be completed. These include (1) consolidation of information and operation of a unified data collection network; (2) determination of the extent, thickness and hydrologic properties of the various aquifer units and estimation of the volume of ground water in storage; (3) delineation of ground-water recharge areas and rates; (4) delineation of ground-water discharge areas and rates; (5) correlation and quantification of water budget components into conceptual regional flow systems; and (6) reporting of results.

In addition to completing the study and preparing a report for Congress, we also hope to initiate the construction of 3-D hydrogeologic framework that could be developed into a ground-water flow model in future years, constrain water-budget estimates for all valleys in the study area, establish long-term data networks and information delivery systems, and institutionalize agency relations and public expectations.

The study is divided into 6 focus areas that will be addressed over the next 28 months. These include (1) data collection and management (organizing existing and new information into a comprehensive database); (2) improving our understanding of the geohydrology of the study area; (3) quantifying recharge for selected basins; (4) quantifying discharge for specific basins; (5) putting together a conceptual model to help explain how all the different factors that affect the hydrology of the study area fit together; and (6) putting together a report that describes the findings. Each of these focus areas will be discussed in future articles.

Just as important as describing what the study plans to complete is a brief discussion of what it won't address. It is critical for people to understand that this study is not the answer to everything and that there are limits to what it can accomplish.

This is not an Environmental Impact Statement (EIS). The EIS is a separate study being carried out by BLM and it has a different focus and purpose.

This study will not produce a calibrated ground-water flow model, although the information from this study is a good step in moving towards this effort in the future.

This study will not answer all questions or alleviate all concerns. There are limits to what the study can accomplish, and most studies often raise additional questions as they seek answers to other questions.

Finally, this study will not fully address all the issues related to using and managing the water resources and how withdrawals of ground water from one place will impact other locations in the study area.

Next week, we will discuss the BARCASS study area and which basins will be addressed. If you have questions about BARCASS or any other water issue, please contact me through the Ely Times or at mstrobel@usgs.gov.